IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| In re application of: McMullin *et al.* | Confirmation No.: 5999 |
| Appl. No.: 10/649,807 | Art Unit: 2614 |
| Filed: August 28, 2003 | Examiner: Le, Lana |
| For: **Apparatus and Method for Local Oscillator Calibration in Mixer Circuits** | Atty. Docket: 1875.4300000 |

# Brief on Appeal Under 37 C.F.R. § 41.37

***Mail Stop Appeal Brief - Patents***

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

A Notice of Appeal from the final rejections of claims 1-19 and 21-33 was filed on February 20, 2009. Appellants hereby file one copy of this Appeal Brief, together with the required fee set forth in 37 C.F.R. § 41.20(b)(2).

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any fees required therefor (including fees for net addition of claims) are hereby authorized to be charged to our Deposit Account No. 19-0036.

## Table of Contents

## *I. Real Party In Interest (37 C.F.R. § 41.37(c)(1)(i))*

The real party in interest in this appeal is Broadcom Corporation, having its principal place of business at 5300 California Avenue, Irvine, California 92617. An assignment of all right, title and interest in and to the above-captioned patent application from inventors Donald G. McMullin, Ramon A. Gomez, Lawrence M. Burns, and Myles Wakayama to Broadcom Corporation was recorded in the U.S. Patent & Trademark Office (USPTO) on August 28, 2003 at Reel 014442, Frame 0086.

## *II. Related Appeals and Interferences (37 C.F.R. § 41.37(c)(1)(ii))*

The Appellants, including the undersigned legal representative and the assignee of the above-captioned application, are aware of no pending appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board of Patent Appeals and Interferences ("the Board") in the pending appeal.

### *III. Status of Claims (37 C.F.R. § 41.37(c)(1)(iii))*

The Application was filed on August 28, 2003 and was assigned U.S. Application No. 10/649,807 ("the '807 application"). The '807 application originally included claims 1-36.

The Examiner mailed a Non-final Office Action rejecting claims 1-36 on December 28, 2005. In an Amendment and Reply filed May 26, 2006, the Appellants presented arguments against the rejections; cancelled claims 20 and 34-36; and amended claims 1, 15, and 27.

A Final Office Action rejecting claims 1-19 and 21-33 was mailed July 27, 2006. In an After-final Reply and Request for Continued Examination filed January 22, 2007, the Appellants presented arguments against the rejections without amending claims 1-19 and 21-33.

The Examiner mailed a Non-final Office Action rejecting claims 1-19 and 21-33 on March 21, 2007. In a Reply filed September 19, 2007, the Appellants presented arguments against the rejections without amending claims 1-19 and 21-33.

The Examiner mailed a Non-final Office Action rejecting claims 1-19 and 21-33 on December 12, 2007. In an Amendment and Reply filed May 12, 2008, the Appellants presented arguments against the rejections and amended claims 1, 15, and 27.

A Final Office Action ("the Final Office Action") rejecting claims 1-19 and 21-33 was mailed August 20, 2008. On February 20, 2009, the Appellants filed a Notice of Appeal, a Pre-Appeal Brief Request for Review, and Arguments to Accompany the Pre-

Appeal Brief Request for Review. Claims 1-19 and 21-33 are on appeal. A copy of the claims on appeal can be found in the attached Claims Appendix.

### *IV. Status of Amendments (37 C.F.R. § 41.37(c)(1)(iv))*

No amendments to the claims have been submitted subsequent to the Final Office Action dated August 20, 2008. All amendments to the claims previously presented during prosecution have been entered.

## *V. Summary of Claimed Subject Matter (37 C.F.R. § 41.37(c)(1)(v))*

A concise explanation of the invention is provided below for each of the independent claims involved in the appeal. The following explanation refers to the specification by page and line number, and to the drawings, if any, by reference characters.

Independent claim 1 recites a method of compensating for passband variation of a bandpass filter in a receiver having a first mixer and a second mixer, where the bandpass filter is coupled between the first mixer and the second mixer. The first mixer is responsive to a first local oscillator signal that is coupled to the first mixer and the second mixer is responsive to a second local oscillator signal. The method includes steps of:

disabling an RF input signal applied to an RF port of said first mixer so that said RF port receives no signal input during a calibration mode (Specification p. 3, ln. 24 to p. 4, ln. 9; p. 6, ln. 4 to p. 7, ln. 20; p. 8, ln. 27 to p. 9, ln. 18; p. 12, ln. 19 to p. 13, ln. 6; paras. [0010], [0024]-[0025], [0031]-[0032], and [0044]; Abstract; originally-filed claim 1; elements 100, 107, and 108 in FIGS. 1A and 1C; elements 300 and 302 in FIG. 3; and elements 108, "RF", and 600 in FIG. 6);

injecting said first local oscillator signal into an LO port of said first mixer (Specification p. 3, ln. 25 to p. 4, ln. 9; p. 6, ln. 26 to p. 7, ln. 20; p. 8, lns. 12-17; p. 10, ln. 20 to p. 13, ln. 6; paras. [0010], [0025], [0029], and [0037]-[0044]; Abstract; originally-filed claim 1; elements 108, 109, and 110 in FIGS. 1A and 1C; elements 300 and 304 in FIG. 3; elements 400 and 402 in FIG. 4; and elements 108, 110, and "LO" in FIG. 6);

leaking said first local oscillator signal from an LO port of said first mixer to an IF port of said first mixer that is coupled to an input port of said bandpass filter (Specification p. 3, ln. 25 to p. 4, ln. 9; p. 6, ln. 4 to p. 7, ln. 20; p. 9, lns. 19-22; p. 10, ln. 20 to p. 13, ln. 6; paras. [0010], [0024]-[0025], [0033], and [0037]-[0044]; Abstract; originally-filed claim 1; elements 100, 108, 109, 110, 111, and 114 in FIGS. 1A and 1C; elements 300 and 304 in FIG. 3; elements 400 and 402 in FIG. 4; and elements 108, 114 and "LO" in FIG. 6);

determining an actual passband of said bandpass filter responsive to said first local oscillator signal (Specification p. 3, ln. 25 to p. 4, ln. 17; p. 6, ln. 4 to p. 7, ln. 20; p. 9, lns. 19-22; p. 10, ln. 20 to p. 13, ln. 6; paras. [0010]-[0011], [0024]-[0025], [0033], and [0037]-[0044]; Abstract; originally-filed claim 1; elements 100, 108, 109, 110, 111, and 114 in FIGS. 1A and 1C; elements 300 and 304 in FIG. 3; elements 400, 402, 404, 406, and 408 in FIG. 4; and elements 108, 114 and "LO" in FIG. 6);

enabling said RF input signal applied to said RF port of said first mixer (Specification p. 5, ln. 24 to p. 7, ln. 20; p. 9, lns. 23-26; p. 12, ln. 19 to p. 13, ln. 6; paras. [0023]-[0025], [0034], and [0044]; elements 107 and 108 in FIGS. 1A and 1C; elements 300 and 306 in FIG. 3; and elements 108, "RF", and 600 in FIG. 6);

mixing an RF input signal having plurality of channels with said first local oscillator signal after said step of determining to generate a first IF signal, including said step of adjusting a frequency of said first local oscillator signal based upon a selected channel of said plurality of channels and based upon said actual passband of said bandpass filter (Specification p. 3, ln. 25 to p. 4, ln. 17; p. 6, ln. 4 to p. 7, ln. 20; p. 9, ln. 23 to p. 10, ln. 19; p. 11, ln. 20 to p. 13, ln. 6; paras. [0010]-[0011], [0024]-[0025],

[0034]-[0036], and [0041]-[0044]; Abstract; originally-filed claim 1; elements 107-111, 136, and 138 in FIG. 1A; elements 107-111 in FIG. 1C; elements 300, 308, and 310 in FIG. 3; elements 400 and 408 in FIG. 4, and elements 108, 110, 114, 136, 138, "LO", and "RF" in FIG. 6).

Independent claim 15 recites a receiver for processing an RF input signal having a plurality of channels. The receiver includes:

a receiver input configured to receive an RF input signal having a plurality of channels (Specification p. 3, lns. 9-14; p. 5, ln. 16 to p. 6, ln. 3; p. 12, ln. 19 to p. 13, ln. 6; paras. [0008], [0022]-[0023], and [0044]; Abstract; originally-filed claim 15; elements 100 and 101 in FIG. 1; and elements "RF" and 600 in FIG. 6);

a first mixer having a first input coupled to said receiver input and a second input coupled to a first local oscillator signal (Specification p. 3, lns. 15-24; p. 6, ln. 4 to p. 7, ln. 20; p. 8, lns. 12-17; p. 10, ln. 20 to p. 11, ln. 13; p. 12, ln. 19 to p. 13, ln. 6; paras. [0009], [0024]-[0025], [0029], [0037]-[0039], and [0044]; Abstract; originally-filed claim 15; elements 100 and 107-109 in FIGS. 1A and 1C; elements 400, 402, and 404 in FIG. 4; and elements 108, 110, "RF", "LO", and 600 in FIG. 6);

a bandpass filter having a passband and an input coupled to an IF output of said first mixer (Specification p. 3, lns. 15-24; p. 5, ln. 3; p. 6, ln. 4 to p. 7, ln. 20; p. 8, ln. 12 to p. 9, ln. 15; p. 9, ln. 27 to p. 13, ln. 6; paras. [0009], [0016], [0024]-[0025], [0029]-[0031], and [0035]-[0044]; Abstract; originally-filed claim 15; elements 100, 108, 111, and 114 in FIGS. 1A and 1C; FIG. 2; elements 308 and 310 in FIG. 3; elements 402, 404, 406, and 408 in FIG. 4; and elements 108, 114, and 600 in FIG. 6); and

a second mixer having an first input coupled an output of the bandpass filter and an second input coupled to a second local oscillator signal (Specification p. 3, lns. 9-24; p. 6, ln. 4 to p. 7, ln. 20; paras. [0008]-[0009] and [0024]-[0025]; originally-filed claim 15; and elements 100, 118, and 124 in FIGS. 1A and 1C);

wherein said passband of said bandpass filter is determined by sweeping a frequency of said first local oscillator signal injected into an LO port of said first mixer during a calibration mode, wherein an RF port of said first mixer receives no signal during said calibration mode, wherein said local oscillator signal leaks from said LO port to said IF output of said first mixer for input into said bandpass filter (Specification p. 3, ln. 25 to p. 4, ln. 9; p. 5, ln. 24 to p. 7, ln. 20; p. 8, ln. 27 to p. 9, ln. 18; p. 9, ln. 27 to p. 10, ln. 14; p. 10, ln. 20 to p. 11, ln. 4; p. 11, lns. 14-19; p. 12, ln. 19 to p. 13, ln. 6; paras. [0010], [0023]-[0025], [0031]-[0032], [0035], [0037]-[0038], [0040], and [0044]; Abstract; originally-filed claim 15; elements 100, 109, 110, and 114 in FIG. 1; elements 300, 302, 304, and 308 in FIG. 3; elements 400, 402, and 406 in FIG. 4; and elements 108, 110, and 114 in FIG. 6).

Independent claim 27 recites a receiver for processing an RF input signal having a plurality of channels. The receiver includes:

a receiver input configured to receive said RF input signal having said plurality of channels (Specification p. 3, lns. 9-14; p. 5, ln. 16 to p. 6, ln. 3; p. 12, ln. 19 to p. 13, ln. 6; paras. [0008], [0022]-[0023], and [0044]; Abstract; originally-filed claims 15 and 27; elements 100 and 101 in FIG. 1; and elements "RF" and 600 in FIG. 6);

a first mixer having a first input coupled to said receiver input and a second input coupled to a first local oscillator signal (Specification p. 3, lns. 15-24; p. 6,

ln. 4 to p. 7, ln. 20; p. 8, lns. 12-17; p. 10, ln. 20 to p. 11, ln. 13; p. 12, ln. 19 to p. 13, ln. 6; paras. [0009], [0024]-[0025], [0029], [0037]-[0039], and [0044]; Abstract; originally-filed claims 15 and 27; elements 100 and 107-109 in FIGS. 1A and 1C; elements 400, 402, and 404 in FIG. 4; and elements 108, 110, "RF", "LO", and 600 in FIG. 6);

a bandpass filter having passband and an input coupled to an IF output of said first mixer (Specification p. 3, lns. 15-24; p. 5, ln. 3; p. 6, ln. 4 to p. 7, ln. 20; p. 8, ln. 12 to p. 9, ln. 15; p. 9, ln. 27 to p. 13, ln. 6; paras. [0009], [0016], [0024]-[0025], [0029]-[0031], and [0035]-[0044]; Abstract; originally-filed claims 15 and 27; elements 100, 108, 111, and 114 in FIGS. 1A and 1C; FIG. 2; elements 308 and 310 in FIG. 3; elements 402, 404, 406, and 408 in FIG. 4; and elements 108, 114, and 600 in FIG. 6);

a programmable gain amplifier (PGA) having an input coupled to an output of said bandpass filter (Specification p. 6, ln. 4 to p. 7, ln. 20; p. 11, lns. 5-13; paras. [0024]-[0025] and [0039]; originally-filed claim 27; and elements 100, 114, and 116 in FIGS. 1A and 1C);

a second mixer having a first input coupled to an output of said programmable gain amplifier and an second input coupled to a second local oscillator signal (Specification p. 3, lns. 9-24; p. 6, ln. 4 to p. 7, ln. 20; p. 11, lns. 5-13; paras. [0008]-[0009], [0024]-[0025], and [0039]; originally-filed claim 27; and elements 100, 114, 116, 118, and 124 in FIGS. 1A and 1C);

a detector circuit that detects a signal level at an output of said PGA and controls a gain of said PGA based on said signal level (Specification p. 6, ln. 3 to p. 7, ln. 20; paras. [0024]-[0025]; originally-filed claim 27; elements 100, 116, and 136 in FIG. 1A);

an LO control circuit that adjusts a frequency of said first local oscillator signal based on (1) a selected channel of said plurality of channels, and (2) a passband of said bandpass filter determined during a calibration mode, wherein said first input of said first mixer receives no signal during said calibration mode, said local oscillator signal provided to said bandpass filter during said calibration mode via a leakage path from an LO port to said IF output of said first mixer (Specification p. 3, ln. 25 to p. 4, ln. 17; p. 6, ln. 4 to p. 7, ln. 20; p. 8, ln. 27 to p. 9, ln. 18; p. 9, ln. 23 to p. 10, ln. 14; p. 10, ln. 20 to p. 13, ln. 6; paras. [0010]-[0011], [0024]-[0025], [0031]-[0032], [0034]-[0035], and [0037]-[0044]; Abstract; originally-filed claim 27; elements 100, 108-111, and 138 in FIG. 1A; elements 400, 402, 404, 406, and 408 in FIG. 4; and elements 108, 110, 114, 136, 138, "LO", and 600 in FIG. 6).

## *VI. Grounds of Rejection to be Reviewed on Appeal (37 C.F.R. § 41.37(c)(1)(vi))*

A concise statement listing each ground of rejection presented for review follows.

### *A. Ground 1*

Claims 1-12, 14-19, 21-22, and 25-26 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,954,625 to Cowley (herein "Cowley") in view of U.S. Patent No. 5,822,687 to Bickley *et al.* (herein "Bickley"). Further, claims 27-30 and 32 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Cowley and Bickley, further in view of U.S. Patent No. 6,678,012 to Belotserkovsky (herein "Belotserkovsky").

### *B. Ground 2*

Claims 13 and 23-24 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Cowley and Bickley, further in view of U.S. Patent No. 6,591,091 to Vorenkamp (herein "Vorenkamp"). In addition, claims 31 and 33 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Cowley, Bickley, Vorenkamp and Belotserkovsky.

## *VII. Argument (37 C.F.R. § 41.37(c)(1)(vii))*

### *A. Rejection of Claims 1-12, 14-19, 21-22, and 25-26 Under 35 U.S.C. § 103(a) Over Cowley in View of Bickley and Rejection of Claims 27-30 and 32 Under 35 U.S.C. § 103(a) Over Cowley and Bickley in View of Belotserkovsky*

In the Final Office Action of August 20, 2008, claims 1-12, 14-19, 21-22, and 25-26 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cowley in view of Bickley. Claims 27-30 and 32 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Cowley and Bickley, in view of Belotserkovsky.

#### *1. The Obviousness Rejections of Claims 1-12, 14-19, 21-22, 25-30, and 32 are in Error and Must be Reversed*

##### *a) The Teachings of Cowley, Bickley, and Belotserkovsky are Insufficient to Establish a* **Prima Facie** *Case of Obviousness Because the Combinations Do Not Teach, Suggest, or Disclose All Claimed Features*

The Examiner does not establish a *prima facie* case of obviousness for claims 1-12, 14-19, 21-22, 25-30, and 32 because *neither Cowley, Bickley, nor Belotserkovsky, alone or in the allegedly obvious combinations, teaches, suggests, or discloses at least the distinguishing features of an RF port receiving no signal during a calibration mode*, as recited in the Appellants' independent claims 1, 15, and 27. Further, *neither Cowley, Bickley, nor Belotserkovsky, alone or in the allegedly obvious combinations, teaches, suggests, or discloses at least the distinguishing features of characterizing a filter using LO port-to-IF port leakage*, as described further below.

In order to establish *prima facie* obviousness of a claimed invention using a combination of references, all claim limitations must be taught or suggested by the combination of cited references. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Further, "[a]ll words in a claim must be considered in judging the patentability of

that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970); *see also* M.P.E.P. § 2143A.

Claims 1-12, 14-19, 21-22, 25-30, and 32 recite distinguishing features that are outside the scope and content of both Cowley and Bickley. For example, the features of independent claim 1 reciting, "disabling an RF input signal applied to an RF port of said first mixer *so that said RF port receives no signal input during a calibration mode,*" "*injecting said first local oscillator signal into an LO port of said first mixer,*" and "*leaking said first local oscillator signal from an LO port of said first mixer to an IF port of said first mixer* that is coupled to an input port of said bandpass filter" are features that distinguish claim 1 over Cowley and Bickley. (Emphasis added). To put these distinguishing features in context, claim 1 recites a method of compensating for passband variation of a bandpass filter that is operating in a dual conversion receiver, where the bandpass filter is configured between a first mixer and a second mixer. A dual conversion receiver (also called a tuner) operates to perform channel selection and down-conversion of a selected channel in a cable TV environment. The first mixer in the dual conversion receiver performs a frequency up-conversion to a higher frequency, the bandpass filter with a fixed passband then performs channel selection, and finally the second mixer performs a down-conversion of the selected channel to an IF frequency. The channel selection accuracy is critically dependent on the passband response of the bandpass filter. *See* Appellants' Specification, paras. [0004]-[0005].

The Appellants' claim 1 recites a method of compensating for (and therefore detecting) passband variation of the bandpass filter, which is disposed between the first mixer and the second mixer. Claim 1 recites the following steps, in part: (1) disabling an RF input signal applied to an RF port of said first mixer *so that said RF port receives no*

*signal input during a calibration mode*; (2) injecting said first local oscillator signal into an LO port of said first mixer; (3) leaking said first local oscillator signal *from a LO port of said first mixer to an IF port* of said first mixer that is coupled to an input port of said bandpass filter; (4) determining an actual passband of said bandpass filter responsive to said first local oscillator signal. Appellants' Claim 1 (emphasis added). Disabling the RF port during the calibration mode, and ensuring no signal at this port, has an advantage of preventing unwanted signal mixing in the first mixer when the LO signal is injected into the LO port.

Independent claim 15 also recites features that distinguish over Cowley and Bickley. Claim 15 recites, for example, "wherein *an RF port of said first mixer receives no signal during said calibration mode*" and "wherein said *local oscillator signal leaks from said LO port to said IF output of said first mixer.*" (Emphasis added). Cowley and Bickley fail to teach the aforementioned distinguishing features of independent claims 1 and 15, thus claims 1-12, 14-19, 21-22, and 25-26 are non-obvious and allowable.

Independent claim 27 also recites features that distinguish over Cowley, Bickley, and Belotserkovsky. Claim 27 recites, for example, "said first input of said first mixer receives no signal during said calibration mode" and "said local oscillator signal provided to said bandpass filter during said calibration mode *via a leakage path from an LO port to said IF output of said first mixer.*" Cowley, Bickley, and Belotserkovsky fail to teach the aforementioned distinguishing features of independent claim 27, thus claims 27-30 and 32 are non-obvious and allowable.

In the discussion that follows, deficiencies of each of the cited references are discussed in turn, starting with Cowley. On page 4 of the Final Office Action, the Examiner admits that Cowley fails to teach, suggest, or disclose the aforementioned

distinguishing features, and is thus deficient: "[e]ven though Cowley disables the RF input signal in calibration mode, a reference signal is still inputted [sic] to the mixer." Final Office Action, p. 4. This is clearly illustrated in Cowley's FIG. 1 as the reference oscillator 6 injecting a calibration signal *into the RF port of the first mixer* 5 when calibrating the filter 10 during the tuner's alignment mode. Cowley, FIG. 1. Cowley even explicitly describes supplying the calibration signal to the RF input of the mixer 10 as "[t]he controller 7, for example, *controls the multiplexer 4 so as to connect the mixer* 5 to the output of the circuit 2 during a reception mode of the tuner and *to the reference oscillator 6 during an alignment mode of operation of the tuner*." *Id.* at col. 4, lns. 16-20 (emphasis added).

Further, Cowley also does not teach the distinguishing features of: "*injecting said first local oscillator signal into an LO port of said first mixer*" and "*leaking said first local oscillator signal from an LO port of said first mixer to an IF port of said first mixer that is coupled to an input port of said bandpass filter*," as recited in claim 1; "*wherein said local oscillator signal leaks from said LO port to said IF output of said first mixer*," as recited in claim 15; and "*said local oscillator signal provided to said bandpass filter during said calibration mode via a leakage path from an LO port to said IF output of said first mixer*," as recited in claim 27. (Emphasis added). Cowley fails to teach, suggest, or disclose these distinguishing features relating to LO to IF leakage because the calibration signal in Cowley is injected into the *RF port* of mixer 5. *See*, Cowley, FIG. 1.; col. 4 lns. 13-21.

Accordingly, Cowley fails to teach, suggest, or disclose the distinguishing features of the Appellants' claims. In an attempt to cure Cowley's deficiencies, the Examiner turns to the Bickley reference.

However, Bickley does not overcome Cowley's deficiencies because Bickley also fails, *both explicitly and inherently*, to teach, suggest, or disclose the distinguishing features of the Appellants' claims. Bickley explicitly describes performing filter calibration on Bickley's filter 16 using a process other than that of the Appellants' claims 1 and 15. *See* Bickley, FIG. 1, col. 3, lns. 6-13. Namely, *Bickley does not isolate an RF port of a mixer, but instead utilizes LO port-to-RF port leakage through an RF port of a mixer* 18, in order to inject a signal $F_S$ into an *output* of the filter 16 to perform the calibration. Bickley, FIG. 1. In Bickley's device, "R" port 38 of mixer 18 is the RF port and "L" port 40 is the LO port. *Id.* at FIG. 1, col. 3, lns. 13-18. Bickley's calibration signal necessarily exists at the RF port 38 of the mixer 18 because Bickley relies on *LO-to-RF port* leakage, directly contrary to the Appellants' claims that call for no signal at the RF port during calibration. Therefore, Bickley cannot teach the distinguishing features of the Appellants' claims. This distinction is important because any signal at the RF port of Bickley's mixer 18 is naturally going to mix with the signal $F_S$ applied at the LO port 40, generating spurious signals that are detrimental to filter calibration.

Further, Bickley also fails to teach, suggest, or disclose the distinguishing features relating to LO to IF leakage because Bickley utilizes *LO port-to-RF port* leakage through mixer 18, in order to inject the signal $F_S$ into the *output* of filter 16 to perform a calibration. *See* Bickley, FIG. 1. In contrast, the Appellants' claim 1 recites the step of *leaking said first local oscillator signal* ***from an LO port of said first mixer to an IF port of said mixer that is coupled to an input port*** *of said bandpass filter*. *See* claim 1. In other words, the Appellants' claim 1 utilizes *LO-to-IF leakage* to inject the LO signal into the filter input, whereas, Bickley uses *LO-to-RF leakage*. Bickley does not, and cannot perform Appellants' recited step, because the LO-to-IF path in Bickley is ***not***

***connected to filter 16***, but instead is connected to the IF output 32. *See* Bickley, FIG. 1. Thus, a person having ordinary skill in the art would not read Bickley's filter alignment methods and devices to *explicitly* describe the distinguishing features of the Appellants' claims.

Bickley also fails to *inherently* teach, suggest, or disclose the distinguishing features of the Appellants' claims. "The inherent teaching of a prior art reference, a question of fact, arises both in the context of anticipation *and obviousness*." *In re Napier*, 55 F.3d 610, 613 (Fed. Cir. 1995) (emphasis added). To establish inherent teaching of a claim element by a cited reference, the Examiner must establish that the claim element is *necessarily* present in the cited reference. *In re Oelrich*, 666 F.2d 578, 581 (C.C.P.A. 1981). "Inherency, however, may not be established by probabilities or possibilities." *Id.* (citing *Hansgrig v. Kemmer*, 102 F.2d 212, 214 (C.C.P.A. 1939)). M.P.E.P. Section 2112(IV) states, in relevant part, "[t]he fact that a certain result or characteristic <u>may</u> occur or be present in the prior art is not sufficient to establish inherency of that result or characteristic" (emphasis in the original) (citing *Hansgrig*, 102 F.2d at 214).

The Examiner does not establish that Bickley cures Cowley's deficiencies by inherently describing the distinguishing features of the Appellants' claims since the Examiner does not show that claim features not taught by Cowley are *necessarily* present in Bickley. Thus, Bickley does not inherently describe the distinguishing features of the Appellant's claims 1, 15, and 27. Bickley fails to cure Cowley's deficiencies because Bickley does not explicitly or inherently teach, suggest, or disclose the distinguishing features of the Appellants' claims.

Belotserkovsky is similarly deficient and fails to cure the deficiencies of Cowley and Bickley because Belotserkovsky also fails to disclose the distinguishing features of the Appellants' claims. Belotserkovsky explicitly describes performing a method of tuning a tuner to correct reception of a signal having an offset frequency by searching for the offset signal starting at an end point of a band of frequencies in which the offset signal may be found. Belotserkovsky, col. 2, lns. 29-33; col. 7, lns. 26-45. Namely, *Belotserkovsky does not isolate an RF port of a mixer, nor calibrate a filter, but instead sweeps a local oscillator while an offset RF signal is received* to tune the tuner. *Id.* Belotserkovsky's tuner 9 receives an RF signal during the search, thus an RF signal necessarily exists at the RF port of the mixer 907. Further, Belotserkovsky does not leak an LO signal from an LO port of Belotserkovsky's mixer 909 to an IF port of the mixer 909 in the absence of a signal at the RF port of mixer 909, but instead performs conventional mixing of an input RF signal with the LO signal. Therefore, Belotserkovsky cannot teach the distinguishing features of the Appellants' claims. A person having ordinary skill in the art would not read Belotserkovsky's filter alignment methods and devices to describe the distinguishing features of the Appellants' claims.

The proposed combination of Cowley and Bickley does not teach each and every feature of independent claims 1 and 15. Further, the proposed combination of Cowley, Bickley, and Belotserkovsky does not teach each and every feature of independent claim 27. Therefore, these proposed combinations of references do not meet the minimum requirements for establishing a *prima facie* case of obviousness. *See* M.P.E.P. § 2143A.

Accordingly, the proposed combinations of Cowley and Bickley also do not establish a *prima facie* case for respective dependent claims 2-12, 14, 16-19, 21-22, and 25-26. *See In Re Fine*, 837 F.2d 1071, 1075 (Fed. Cir. 1988). Similarly, the proposed

combination of Cowley, Bickley, and Belotserkovsky does not establish a *prima facie* case for respective dependent claims 28-30 and 32. *Id.* The arguments in the Final Office Action do not overcome the Appellants' arguments presented in the previous Reply and do not establish a *prima facie* case of obviousness of claims 1-12, 14-19, 21-22, 25-30, and 32.

Therefore, the Appellants respectfully request that the Board reverse the Examiner's final rejection of claims 1-12, 14-19, 21-22, 25-30 and 32 under 35 U.S.C. § 103(a), and remand this application for issue.

***b) The Teachings of Cowley and Bickley are Insufficient to Establish a* Prima Facie *Case of Obviousness Because Both Cowley and Bickley Individually Teach Away from the Claims***

The Examiner does not establish a *prima facie* case of obviousness for claims 1-12, 14-19, 21-22, 25-30, and 32 because Cowley and Bickley individually teach away from the claims.

"A *prima facie* case of obviousness can be rebutted if the applicant . . . can show 'that the art in any material aspect taught away' from the claimed invention." *In re Geisler*, 116 F.3d 1465, 1469 (Fed. Cir. 1997). "A reference may be said to teach away when a person of ordinary skill, upon reading the reference . . . would be led in a direction divergent from the path that was taken by the applicant." *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999). When determining if a cited reference teaches away, a reference should be considered as a whole, and portions arguing against or teaching away from the claimed invention must be considered. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 230 USPQ 416 (Fed. Cir. 1986); *Gillette Co. v. S.C. Johnson & Sons, Inc.*, 919 F.2d 720, 724, 16

USPQ2d 1923, 1927 (Fed. Cir. 1990) (stating that the closest prior art reference "would likely discourage the art worker from attempting the substitution suggested by [the inventor/patentee]"). The United States Supreme Court has also recently opined about the impact of teaching away on nonoviousness, stating in *KSR Int'l. Co. v. Teleflex, Inc.* "[w]hen the prior art teaches away from combining certain known elements, discovery of successful means of combining them is more likely to be nonobvious." 550 U.S. 398, 127 S. Ct. 1727, 82 U.S.P.Q.2d 1385 (2007).

Both Cowley and Bickley teach away from claims 1-12, 14-19, 21-22, 25-30, and 32 because each of these references teaches away from the distinguishing features of these claims. As described above, distinguishing features of claim 1 include, for example "disabling an RF input signal applied to an RF port of said first mixer *so that said RF port receives no signal input during a calibration mode.*" Additionally, claim 15 recites, for example, "wherein *an RF port of said first mixer receives no signal during said calibration mode.*" Further, claim 27 recites, for example, "said first input of said first mixer receives no signal during said calibration mode."

In contrast, Cowley explicitly teaches that the RF input port of the first mixer 5 receives a signal during an alignment mode. Cowley, col. 4, lns. 16-20. Cowley describes connecting the calibration signal to the RF input of the mixer 10 as "[t]he controller 7, for example, controls the multiplexer 4 so as *to connect the mixer 5* to the output of the circuit 2 during a reception mode of the tuner and *to the reference oscillator 6 during an alignment mode of operation of the tuner.*" *Id.* (emphasis added); *See also* Final Office Action, p. 4 (Admitting that "[e]ven though Cowley disables the RF input signal in calibration mode, a reference signal is still inputted [sic] to the mixer.").

Since Cowley explicitly requires receiving a signal at the RF port of the mixer during an alignment mode, Cowley leads the person of ordinary skill away from isolating the RF port of the mixer during calibration, down a divergent path from that claimed by the Appellants. Cowley teaches away from the Appellants' claims, therefore, a *prima facie* case of obviousness is not established.

Bickley also teaches away from the Appellants' claims. Bickley explicitly teaches using LO port-to-RF port leakage through the mixer 18, to inject the signal $F_S$ into an *output* of the filter 16 to perform an alignment. Bickley, FIG. 1; col. 3, lns. 13-18. Thus, the RF port 38 of Bickley's mixer 18 receives a signal from the LO port 40 during calibration. *Id.* Bickley's calibration signal necessarily exists at the RF port 38 of the mixer 18 because Bickley relies on *LO-to-RF port* leakage. *Id.*

Since Bickley explicitly requires receiving a signal at the RF port of the mixer during the alignment mode, Bickley leads the person of ordinary skill away from isolating the RF port of the mixer during calibration, down a divergent path from that claimed by the Appellants. Bickley teaches away from the Appellants' claims, therefore, a *prima facie* case of obviousness is not established.

The final Office Action does not address the problem of Cowley's explicit teaching away the distinguishing features of the Appellants' claims, nor does it address the problem of Bickley's explicit teaching away the distinguishing features of the Appellants' claims. A *prima facie* case of obviousness is not established for claims 1-12, 14-19, 21-22, 25-30, and 32. Therefore, the Appellants respectfully request that the Board reverse the Examiner's final rejection of claims 1-12, 14-19, 21-22, 25-30, and 32 under 35 U.S.C. § 103(a) and remand this application for issue.

### *B. Rejection of Claims 13 and 23-24 Under 35 U.S.C. § 103(a) Over Cowley and Bickley in View of Vorenkamp and of Claims 31 and 33 Under 35 U.S.C. § 103(a) Over Cowley, Bickley, Belotserkovsky, and Vorenkamp*

In the Final Office Action of August 20, 2008, claims 13 and 23-24 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Cowley and Bickley, further in view of Vorenkamp. Claims 31 and 33 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Cowley, Bickley, Belotserkovsky, and Vorenkamp.

#### *1. The Obviousness Rejections of Claims 13, 23-24, 31, and 33 are in Error and Must be Reversed*

##### *a) Claims 13, 23-24, 31, and 33 are Non-obvious by Being Dependent on a Respective Non-obvious Independent Claim*

Dependent claims 13, 23-24, 31, and 33 are allowable for being dependent from an allowable respective independent claim. In the case *In Re Fine*, six dependent claims depended from two non-obvious independent claims. 837 F.2d at 1075. The United States Court of Appeals for the Federal Circuit held that the six "[d]ependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." *Id.*; *see also,* M.P.E.P. § 2143.03.

As shown above, independent claims 1, 15, and 27 are non-obvious over Cowley, Bickley, and Belotserkovsky. Just like the six dependent claims in the case *In Re Fine*, the Appellants' dependent claims 13, 23-24, 31, and 33 depend upon their respective non-obvious independent claims 1, 15, and 27. Thus, claims 13, 23-24, 31, and 33 are similarly allowable over the cited references for being dependent on an allowable independent claim. *Id.* Further, the Final Office Action does not use Vorenkamp or Belotserkovsky to teach or suggest the distinguishing features discussed herein with regard to independent claims 1, 15, and 27, nor do Vorenkamp or Belotserkovsky

remedy the deficiencies of Cowley and Bickley, either alone or in combination. Thus, dependent claims 13, 23-24, 31, and 33 are allowable for at least being dependent from an allowable respective independent claim, in addition to their own patentable features beyond the features recited in independent claims 1, 15, and 27.

The augments in the Final Office Action do not overcome the Appellants' arguments presented in the previous Reply and do not establish a *prima facie* case of obviousness of claims 13, 23-24, 31, and 33. Therefore, the Appellants respectfully request that the Board reverse the Examiner's final rejections of claims 13, 23-24, 31, and 33 under 35 U.S.C. § 103(a) and remand this application for issue.

### *VIII. Conclusion*

The subject matter of claims 1-19 and 21-33 is patentable over the cited references because the Examiner does not establish a *prima facie* case of obviousness. Therefore, the Appellants respectfully request that the Board reverse the Examiner's final rejections of claims 1-19 and 21-33 under 35 U.S.C. § 103(a) and remand the '807 application for issue.

Respectfully submitted,

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## *IX. Claims Appendix (37 C.F.R. § 41.37(c)(1)(viii))*

1. In a receiver having a first mixer, a second mixer, and a bandpass filter coupled between said first mixer and said second mixer, said first mixer responsive to a first local oscillator signal that is coupled to said first mixer and said second mixer responsive to a second local oscillator signal, a method of compensating for passband variation of said bandpass filter, comprising:

disabling an RF input signal applied to an RF port of said first mixer so that said RF port receives no signal input during a calibration mode;

injecting said first local oscillator signal into an LO port of said first mixer;

leaking said first local oscillator signal from an LO port of said first mixer to an IF port of said first mixer that is coupled to an input port of said bandpass filter;

determining an actual passband of said bandpass filter responsive to said first local oscillator signal;

enabling said RF input signal applied to said RF port of said first mixer;

mixing an RF input signal having plurality of channels with said first local oscillator signal after said step of determining to generate a first IF signal, including said step of adjusting a frequency of said first local oscillator signal based upon a selected channel of said plurality of channels and based upon said actual passband of said bandpass filter.

2. The method of claim 1, wherein the step of determining includes the steps of:

sweeping said frequency said first local oscillator signal; and

measuring an output of said bandpass filter responsive said sweeping step, to determine said actual passband of said bandpass filter.

3. The method of claim 1, wherein the step of adjusting said frequency of said first local oscillator signal includes the step of setting a frequency of said first local oscillator signal so said selected channel in said first IF signal falls within said actual passband of said bandpass filter.

4. The method of claim 1, wherein said step of adjusting said frequency includes the step of setting said frequency of said first local oscillator signal so as to compensate for variation of said actual passband of said bandpass filter.

5. The method of claim 4, wherein said variation is caused by a temperature variation of said bandpass filter.

6. The method of claim 4, wherein said variation is caused by manufacturing tolerance variation of said bandpass filter.

7. The method of claim 1, wherein said of step of injecting includes the steps of:

coupling said first local oscillator signal to a local oscillator port of said first mixer when said RF input signal is disabled.

8. The method of claim 7, further comprising the step of leaking said first local oscillator signal through said first mixer to an input port of said bandpass filter.

9. The method of claim 1, wherein said step of mixing includes the step of up-converting said selected channel in said first IF signal into said actual passband of said bandpass filter.

10. The method of claim 9, further comprising the step of filtering said first IF signal so that said selected channel and at most one other channel pass through said bandpass filter.

11. The method of claim 9, further comprising the step of filtering said first IF signal so that only said selected channel passes through said bandpass filter.

12. The method of claim 9, further comprising the step of mixing said selected channel at an output of said bandpass filter with a second local oscillator signal in said second mixer to down-converted said selected channel to baseband.

13. The method of claim 9, wherein said step of mixing said selected channel includes the step of providing image rejection for said selected channel.

14. The method of claim 1, further comprising the step of filtering said first IF signal to generate an output passband that passes said selected channel and at most one other channel.

15. A receiver for processing an RF input signal having a plurality of channels, comprising:

a receiver input configured to receive an RF input signal having a plurality of channels;

a first mixer having a first input coupled to said receiver input and a second input coupled to a first local oscillator signal;

a bandpass filter having a passband and an input coupled to an IF output of said first mixer; and

a second mixer having an first input coupled an output of the bandpass filter and an second input coupled to a second local oscillator signal;

wherein said passband of said bandpass filter is determined by sweeping a frequency of said first local oscillator signal injected into an LO port of said first mixer during a calibration mode, wherein an RF port of said first mixer receives no signal during said calibration mode, wherein said local oscillator signal leaks from said LO port to said IF output of said first mixer for input into said bandpass filter.

16. The receiver of claim 15, wherein after said calibration mode, said frequency of said first local oscillator is adjusted so that a selected channel of said plurality of channels falls in said passband of said bandpass filter that is determined during said calibration mode.

17. The receiver of claim 15, wherein after said calibration mode, said frequency of said first local oscillator signal is adjusted to account for any passband variation so that said selected channel of said plurality of selected channels is up-converted into said passband of bandpass filter

18. The receiver of claim 15, further comprising a means for detecting a power output of said bandpass filter responsive to said first local oscillator during said calibration mode, said passband determined from said power output.

19. The receiver of claim 18, further comprising a local oscillator control module that receives said power output from said bandpass filter and determines said passband of said bandpass filter based on said power output, and controls a frequency of said first local oscillator signal responsive to said passband of said bandpass filter.

21. The receiver of claim 15, wherein during said calibration mode, said local oscillator signal is swept over a frequency bandwidth sufficient to include said passband of said bandpass filter.

22. The receiver of claim 15, wherein during said calibration mode, said local oscillator signal is swept from a first frequency to a second frequency, said passband of said bandpass filter within a bandwidth defined by said first frequency and said second frequency.

23. The receiver of claim 15, wherein at least one of said first mixer, said second mixer, and said bandpass filter includes differential inputs and differential outputs.

24. The receiver of claim 15, wherein said first mixer, said second mixer, and said bandpass filter are differential.

25. The receiver of claim 15, wherein said first mixer and said second mixer are disposed on a common substrate.

26. The receiver of claim 25, wherein said bandpass filter is disposed external to said common substrate.

27. A receiver for processing an RF input signal having a plurality of channels, comprising:

a receiver input configured to receive said RF input signal having said plurality of channels;

a first mixer having a first input coupled to said receiver input and a second input coupled to a first local oscillator signal;

a bandpass filter having passband and an input coupled to an IF output of said first mixer;

a programmable gain amplifier (PGA) having an input coupled to an output of said bandpass filter;

a second mixer having a first input coupled to an output of said programmable gain amplifier and an second input coupled to a second local oscillator signal;

a detector circuit that detects a signal level at an output of said PGA and controls a gain of said PGA based on said signal level;

an LO control circuit that adjusts a frequency of said first local oscillator signal based on (1) a selected channel of said plurality of channels, and (2) a passband of said bandpass filter determined during a calibration mode, wherein said first input of said first mixer receives no signal during said calibration mode, said local oscillator signal provided to said bandpass filter during said calibration mode via a leakage path from an LO port to said IF output of said first mixer.

28. The receiver of claim 27, wherein said frequency of said first local oscillator signal is swept during said calibration mode, and said detector circuit detects said signal level at said output of said PGA responsive to said first local oscillator signal to determine said passband of said bandpass filter.

29. The receiver of claim 27, wherein said LO control circuit adjusts said frequency of said first local oscillator signal so that said selected channel of said plurality of channels falls in said passband of said bandpass filter.

30. The receiver of claim 27, wherein said passband of said bandpass filter is at most 2 channels wide.

31. The receiver of claim 27, wherein said first mixer and said second mixer are differential.

32. The receiver of claim 31, wherein said first mixer and said second mixer are disposed on a common integrated circuit substrate, and said bandpass filter is disposed external to said common integrated circuit substrate.

33. The receiver of claim 31, wherein said second mixer is an image rejection mixer.

## *X. Evidence Appendix (37 C.F.R. § 41.37(c)(1)(ix))*

None.

## *XI. Related Proceedings Appendix (37 C.F.R. § 41.37(c)(1)(x))*

None.